

**THE 15TH SYMPOSIUM ON HUMAN FACTORS IN AVIATION
MAINTENANCE**

'Practical solutions for a complex world'

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KEYNOTE ADDRESS

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The subject of Human Factors in Aviation Maintenance, and particularly this year's theme that focus's on "Practical Solutions" is one in which I have a special interest. This is not just because I come from an engineering background. It's because the subject embraces all the complexities and frailties of organisations and individuals. It involves the structure of organisations; their management; the organisational systems in place; the many cultures within an organisation and of course the characteristic strengths and weaknesses of the individuals involved. As safety professionals, if this array of issues doesn't capture your interest then I really think that you ought to be checking that you still have a pulse.

The purpose of a Keynote Address to is set the scene for the symposium. It is to lay before you what we hope to achieve in these three days and to encourage delegates to fully participate in the proceedings. When I sat down to decide how to go about this task it didn't take me long to realise that one important fact that applies to aviation safety in general, and to aviation maintenance in particular, is to use an old expression, that "there is

nothing new under the sun". We already know what most of the safety issues are. We have experienced them in the form of accidents and incidents many times in recent years. The aviation safety databases are literally full of safety issues that we as an industry have yet to properly address. The theme of my Keynote Address therefore will be that we, collectively, need to do much better at affecting the changes in maintenance culture and practice that we all know are needed.

When I joined the AAIB in 1975 as a 'youngish' investigator, one of my mentors was a cynical old investigator who had achieved the position of elder statesman in the organisation. He had been with the AAIB for almost 40 years. He had served as an investigator throughout the years of the Second World War. He had been everywhere, he had seen everything, and he was a steadying hand on me and my contemporaries who, were at the time comparatively wet behind the ears, and occasionally over keen 'as he saw it' to achieve rapid results. He was also very irreverent, particularly to those in our industry who he considered were just going through the motions without a very clear commitment to improving safety. One of his favourite utterances, that will always remind me of him, was that he claimed that there were two types of people that you are likely to meet in the aviation safety business. He said that there were those who strive to improve aviation safety through their work and who, as a result, were able to influence change. Then there were those that just talked about safety. As ever, there was an element of truth in his argument. The one thing that our industry does more than any comparable industry, is talk about safety in a wide range of forums. This forum being just one of them. Despite our best intentions however, this talk is not always translated into a safety action despite the many good ideas exchanged at our conferences and symposiums. A simple test could be to think back to the 14th Symposium on Human Factors in Aviation Maintenance last year and ask yourself what was discussed and what has changed in the intervening period. It's a sobering

exercise and one that should spur us on to make greater efforts to ensure that these deliberations are translated into action.

Looking at the delegate list for this symposium, it is clear to me that we have a large number of movers and shakers here in London. This is just as well because there is a great deal that needs to be done if we are to ensure that poor maintenance practices will not contribute to major public transport accidents.

What do we need to do then to improve the situation? Well, the usual starting point is to look at the accident/incident data that we've gathered over the years. Now, I believe that we do a reasonable job of collecting data on accidents and series incidents. These events have high profiles and it's not possible to disregard them. We do not however, do anything like an adequate job of collecting data on other types of incidents. With a few notable exceptions, relatively few States have systems that gather data on other safety related occurrences. If this class of data is gathered at all, it resides in company record systems that are generally not available to the industry at large. A very large numbers of incidents that could change our view of aviation maintenance are not available to us on a world-wide basis. For every safety occurrence that we have in our various databases there are likely to be 10 to 20 times as many incidents that go unreported. Our view of aviation maintenance and our thoughts in terms of safety action is probably dictated by view of only the tip of this particular iceberg.

The second issue that I'd like to draw your attention too is that where we do have data we have not until now conducted anything like a proper analysis. This is changing however and while history will probably characterise the last few decades of the 20th century as the data gathering years, I hope that the early years of this new millennium will be recognised as the data analysis years.

Our global analysis of the primary causal factors involved in catastrophic public transport accidents reveals that Controlled Flight into Terrain (CFIT) heads the list broad accident categorisations. This is closely followed by approach and landing accidents. Accidents attributable to maintenance, apparently come well down the list. This rudimentary form of analysis, inevitably concentrates attention on the flight crew's contribution to the exclusion of other factors. This can mask the fact that within many of these accidents there are often a number of maintenance related issues that have played a part in the overall circumstances of the accident. The problem is that underlying or systemic causes are often more subtle and it's more difficult to get a clear understanding of their contribution, even with the benefit of 20-20 hindsight.

Probably the best source of data comes from those events that have been the most thoroughly investigated. These are usually but not exclusively the accident and serious incident investigations conducted by States investigating agencies. Because these events have been examined in the greatest detail they provide perhaps the best source of information on the systemic causes of accidents and incidents arising from maintenance practices.

In recent years the AAIB our counterparts around the world have conducted a number of investigations that have provided an insight into maintenance practices and their unforeseen consequences. Lets look at some of the common features identified as maintenance causal factors in these events as a means of anchoring our thoughts at the start of this Symposium.

- The majority of maintenance operations are conducted at night when engineers are probably operating at their circadian low and many of the airlines or maintenance organisations support functions, for instance the quality audit functions, are not active.

- Unscheduled maintenance tasks often suffer from inadequate pre-planning in terms of the necessary documentation, equipment and spares provision, often compounded by unrealistic estimates for the work to be done. It all culminates in additional pressures on engineering staff.
- Staff shortages as a result of sickness and/or leave patterns and inadequate cover, are often identified as causal factors when things go wrong.
- Engineering supervisors becoming involved in maintenance operations in a hands-on capacity often as a result of staff shortages. When this happens they are no longer supervising the maintenance operation and an essential element in the safety system is lost.
- Interruptions during a maintenance task inevitably cause a loss of continuity and are a regular cause of maintenance work being incorrectly completed.
- A failure to use the maintenance manual or illustrated parts catalogue. This is endemic throughout the maintenance industry and features regularly in causes of accidents and incidents. It is often compounded by the fact that manuals are often difficult to use and on occasions confusing and misleading.
- Maintenance shift hand-overs are often poor, being characterised by lack of comprehensive briefing and stage sheet completion.
- Maintenance operations carried out in a poor physical environment. This applies mostly to unplanned maintenance tasks being conducted at locations that are less than ideal. Poor lighting and inadequate protection from weather can contribute to the causes of accidents and incidents.

- Engineers isolated from the usual technical support and subjected to considerable time pressures. This feature most often occurs when repairs are carried out at airports away from maintenance bases. Engineering are then subjected to pressures from airline management and the flight crew who are having to deal with irate passengers subject to considerable delays.
- A determination to cope with all challenges. This strength in the aviation maintenance workforce can also be one of the major weaknesses in that the best engineers have a strong 'can-do' culture that can lead to errors of judgement particularly when operating under pressure.
- The large number of contract maintenance engineers operating in the industry present a risk that needs to be managed. They will often be unfamiliar with local facilities, practices and procedures.
- Perhaps the most common causal element is that there is a cultural acceptance of all, or at least many, of the above factors.

As I stated earlier there is much to do and this is against a background of skill shortages that are a result of a form of global myopia that has led to a shortfall in the training of new engineers to join our industry. As a result we now face a world wide shortage of trained engineers and mechanics and that presents our industry with perhaps its greatest risk. Even more reason then to put right some of the known deficiencies and to create a culture in our maintenance organisations that ensures that everyone recognises their individual responsibility for ensuring the best maintenance standards.

When our industry decides to focus on a particular issue, significant progress can be made. The CFIT and Approach and Landing Accident Reduction task forces are good examples. The ICAO safety oversight Programme is another. What these initiatives had however, and what some other worthwhile

initiatives have lacked, is a thorough examination of the global safety record and a comprehensive analysis that allowed a proper focus and realistic targets to be set. Above all they had the international co-ordination and impetus to see the process through.

My message to you all therefore is that this subject warrants the international approach given to other global safety initiatives. It's a subject that will benefit greatly from the dissemination of industry best practice and an action plan that will address the issues. This Symposium has an excellent programme of presentations and interactive sessions. I congratulate the organising Committee for bringing together, as speakers and delegates, so many key individuals in the maintenance world. This Symposium is not however, an end unto itself. While a lot of important interchange will take place here over the next 3 days, it's primary purpose is to act as a catalyst to motivate you, such that when you return to your companies and organisations you decide, with others, to set about making a difference. After all the Theme of this Symposium is "Practical Solutions for a Complex World". Make good use of it.

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